Safety Element

City of Solvang General Plan Program

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SOLVANG GENERAL PLAN
SAFETY ELEMENT

[1989]

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Adopted _____ 1988

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1.0 INTRODUCTION

1.1 OVERVIEW

1.1.1 Contents of Element

This safety element identifies existing conditions and issues involving potential hazards and public safety considerations relevant to Solvang. This element also sets forth goals, objectives, and policies to provide for public health, safety, and welfare.

1.1.2 Key Issues

The key issues affecting the health and safety of Solvang's residents and visitors are hazards associated with seismicity, slope stability, flooding along the Santa Ynez River and Alamo Pintado Creek, structural fires, and potential wildfires in hillside areas. These and other public safety issues are described in Section 2.0 of this element.

1.1.3 Overview of Goals, Objectives, and Policies

The goals of this element are to minimize potential hazards and to provide a safe and secure environment for the public. To achieve these goals, a comprehensive set of objectives and policies is established. These objectives and policies involve specific measures and programs to ensure that potential risks are minimized or avoided, particularly during the development process. Further, these objectives and policies provide the framework for ensuring the city's ability to respond adequately to emergencies.

1.2 PURPOSE

This safety element is intended to document potential hazards that must be considered in planning the location, type, and density of development. By identifying the nature and location of potential hazards, the city of Solvang has been able to adopt a land use plan that reflects such hazards and has been able to establish appropriate programs to prevent or minimize death, injuries, damage to property, and economic and social dislocation resulting from public safety hazards.

1.3 AUTHORIZATION

Government Code Section 65302(g) requires the adoption of a safety element to protect the public from unreasonable risks associated with seismic hazards, geologic hazards, flooding, fire, and other public safety hazards.

2.0 EXISTING CONDITIONS/ISSUE ANALYSIS

2.1 GEOLOGIC AND SEISMIC HAZARDS

2.1.1 Seismic Setting

Solvang is located in the western segment of the Transverse Range geologic province. The Transverse Range province is an east-west physiographic feature which includes the San Bernardino Mountains, the San Gabriel Mountains, the Santa Monica Mountains, the Channel Islands, and the Santa Ynez Mountains. The formation of this province's mountain ranges and other features is due to the relative movement of the Pacific and North American continental plates. The province is bisected by the San Andreas fault and is transected by a number of east-west trending faults.

The movement of the continental plates is manifested primarily along the San Andreas fault system, which bisects the Transverse Range province. A number of other faults are found in the Santa Barbara region. These include the Big Pine and Santa Ynez faults. Numerous other faults are located along the coastal portion of this region and offshore in the vicinity of the Channel Islands. Table 1 summarizes the key features of faults located in the Santa Barbara region that could affect Solvang.

Table 1

REGIONAL SEISMICITY

Fault Name	Fault Length (miles)	Estimated Magnitude of Maximum Credible Earthquake
Historically Active (HA):		
Big Pine	53	7.1
San Andreas	620	8.4

Table 1 (cont'd)

REGIONAL SEISMICITY

Fault Name	Fault Length (miles)	Estimated Magnitude of Maximum Credible Earthquake
Active (A):		
Big Pine Extension	70	7.2
Graveyard-Turkey Trap	7	5.6
Mesa	4+	5.0+
More Ranch	9+	5.8+
Nacimiento	170	7.6
Pacifico	13+	6.3+
Santa Cruz Island	13+	6.3+
Santa Rosa Island	12+	6.2+
Santa Ynez	75+	7.2+
Potentially Active (PA):		
Arroyo Parida	24+	6.6+
Bradley Canyon	5	5.2
Carpinteria	3+	4.5+
Goleta	3	4.5
Mission Ridge	5+	5.2+
Red Mountain	13+	6.3+
Rincon Creek	15+	6.4+
San Jose	9	5.8

Source: County of Santa Barbara, Seismic Safety and Safety Element - Santa Barbara County Comprehensive Plan, January 1979.

As reflected in Table 1, Solvang is located in a region of high seismic activity. Most of the historic seismic events in the Santa Barbara region have been centered offshore between Santa Barbara and the Channel Islands. Table 2 below summarizes the most notable earthquakes in the region.

Table 2

RECENT HISTORY OF SEISMIC ACTIVITY IN THE SANTA BARBARA REGION

Year	Location	Richter Magnitude[1]
1812	Santa Barbara Channel	7.1
1902	North of Santa Ynez fault	5.5
1925	Santa Barbara Channel	6.2
1926	East of Santa Barbara	5.5
1927	Offshore west of Point Arguello	7.3
1941	Southeast of Santa Barbara	5.9
1968	Santa Barbara Channel	5.2[2]
1973	Point Mugu	5.9

1 Richter magnitudes for earthquakes prior to 1941 are estimated based on historical data and are not the result of actual measurements.

2 The 5.2 earthquake of 1968 was the largest of a swarm of 63 earthquakes with magnitudes exceeding 1.5 which occurred in the Santa Barbara Channel area during the summer of 1968.

The 1812 earthquake is estimated to have been a 7.1 magnitude quake. It reportedly resulted in major damage to adobe buildings such as the Missions in the southern California area. In particular, the Mission La Purisima in the Lompoc area was destroyed.

More recently, the 1925 earthquake took thirteen lives and caused extensive damage in Santa Barbara and surrounding areas. Damage estimates range from more than $6 million to $20 million.

2.1.2 Geologic and Seismic Constraints to Development

The suitability of land for development is influenced strongly by the presence of certain geologic and seismic hazards. These hazards range from the direct and indirect effects associated with earthquakes to problems associated with slope stability and soil conditions that are not conducive to development. The general nature of various geologic and seismic constraints to development and their applicability to Solvang are described below.

SEISMIC SHAKING

The energy released by movement along a fault travels through the earth's crust as shock waves which cause the ground motion associated with earthquakes. The severity of ground motion at any given location is related to the total amount of energy released, the distance from the earthquake's origin, and the character of surface and subsurface geologic conditions.

A commonly used method of measuring the severity of ground motion involves estimating maximum ground acceleration. Acceleration is defined as the increased velocity given to the ground by shock waves passing through the geologic structure. Acceleration is typically described in terms of gravitational force where one unit of gravitational force (designated as "1g") is equal to 9.8 meters/sec^2.

The degree of ground acceleration is a function of underlying geologic materials. As shock waves pass through loose, unconsolidated geologic materials, the amplitude of the waves is greater than that associated with

dense, consolidated materials (eg., hillside and mountain areas). Thus, the higher amplitude of shock waves results in greater ground acceleration in areas underlain by alluvial soils or water-saturated sediments.

In summary, urban development on alluvial deposits in the Solvang area is likely to experience a greater degree of ground shaking than Solvang's hillside areas during an earthquake. As a result, structues built on the alluvial soils along the Santa Ynez River and Alamo Pintado Creek could experience more damage than those built in hillside areas. However, it should be noted that ground shaking in hillside areas could induce the slumping of geologic structures or landslides in areas of slope instability.

One method of measuring the effects of seismic shaking at specific locations is through use of the Modified Mercalli Scale. As shown on Table 3, this scale represents the classification of an earthquake's effects according to twelve categories ranging from "not felt" to "damage nearly total." This is a subjective scale in that an earthquake's intensity is measured in relation to its effect on human life.

SURFACE RUPTURE

The sudden horizontal or vertical displacement along an earthquake fault, which releases the energy associated with earthquakes, may occur far enough below the earth's surface where such displacement is not visible. However, fault movement often extends to the earth's surface where ground rupture or displacement occurs along the fault plane. The extent of surface rupture is dependent upon the fault's length and the magnitude of the earthquake.

Concern about the growing number of structures located on or near active and potentially active faults led the state of California to enact the Alquist-Priolo Geologic Hazards Zone Act of 1972, revised in 1975 and renamed the Alquist-Priolo Special Studies Zone Act. This act requires that geologic studies must be undertaken prior to the approval of structures for human occupancy located within "special study zones." Said studies are to determine the precise location and necessary setbacks from identified faults.

Table 3

MODIFIED MERCALLI INTENSITY SCALE

Intensity. A subjective measure of the force of an earthquake at a particular place as determined by its effects on persons, structures, and earth materials. The principal scale used in the United States today is the Modified Mercalli, 1956 version as defined below (modified from Richter, 1958).

I. Not felt.

II. Felt by persons at rest, on upper floors, or favorably placed.

III. Felt indoors. Hanging objects swing. Vibration like passing of light trucks. Duration estimated. May not be recognized as an earthquake.

IV. Hanging objects swing. Vibration like passing of heavy trucks; or sensation of a jolt like a heavy ball striking the walls. Standing automobiles rock. Windows, dishes, doors rattle. Wooden walls and frame may creak.

V. Felt outdoors; direction estimated. Sleepers wakened. Liquids disturbed, some spilled. Small unstable objects displaced or upset. Doors swing. Shutters, pictures move. Pendulum clocks stop, start, change rate.

VI. Felt by all. Many frightened and run outdoors. Persons walk unsteadily. Windows, dishes, glassware broken. Knickknacks, books, etc., off shelves. Pictures off walls. Furniture moved or overturned. Weak plaster and masonry D[1] cracked.

VII. Difficult to stand. Noticed by drivers of automobiles. Hanging objects quiver. Furniture broken. Weak chimneys broken at roof line. Damage to masonry D, including cracks; fall of plaster, loose bricks, stones, tiles, and unbraced parapets. Small slides and carving in along sand or gravel banks. Large bells ring.

VIII. Steering of automobiles affected. Damage to masonry C; partial collapse. Some damage to masonry B; none to masonry A. Fall of stucco and some masonry walls. Twisting, fall of chimneys, factory stacks, monuments, towers, elevated tanks. Frame houses moved on foundations if not bolted down; loose panel walls thrown out. Decayed piling broken off. Branches broken from trees. Changes in flow or temperature of springs and wells. Cracks in wet ground and on steep slopes.

IX. General panic. Masonry D destroyed; masonry C heavily damaged, sometimes with complete collapse; masonry B seriously damaged. General damage to foundations. Frame structures, if not bolted, shifted off foundations. Frames racked. Serious damage to reservoirs. Underground pipes broken. Conspicuous cracks in ground and liquefaction.

X. Most masonry and frame structures destroyed with their foundations. Some well-built wooden structures and bridges destroyed. Serious damage to dams, dikes, embankments. Large landslides. Water thrown on banks of canals, rivers, lakes, etc. Sand and mud shifted horizontally on beaches and flat land. Rails bent slightly.

XI. Rails bent greatly. Underground pipelines completely out of service.

XII. Damage nearly total. Large rock masses displaced. Lines of sight and level distorted. Objects thrown in the air.

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1 See Uniform Building Code for specifications on quality of masonry construction.

Source: Seismic Hazards and Land Use Planning, USGS Circular 690, by D.R. Nichols and J.M. Buchanan-Banks, 1974.

"Special studies zones" are strips one-eighth of a mile or more wide along each side of faults recognized as active or potentially active by the State Geologist, within which the danger of fault rupture is presumed to exist until otherwise demonstrated by direct investigation. Active faults are those with known movement during the past 11,000 years. Potentially active faults are those with known movement during the past two-to-three million years.

In addition to mandating geologic studies for public structures proposed for areas within "special studies zones," the Alquist-Priolo Act prohibits the development of such structures within fifty feet of an active fault which has displaced the ground surface. The State Geologist has not designated any "special studies zones" in or near Solvang. (The only such zone in Santa Barbara County is located in the Los Alamos area near Highway 101).

LIQUEFACTION

Liquefaction is the substantial loss of strength of poorly consolidated and saturated soils due to the effects of seismic shaking. The passage of seismic waves through such soils can cause soil particles to be suspended temporarily in water, creating conditions very similar to quicksand. The resultant loss of strength can cause significant damage to structures as they settle, tilt, or collapse.

The potential for liquefaction in a given area is dependent upon soil characteristics, groundwater conditions, and the intensity of seismic shaking. In the Solvang area, the greatest potential for liquefaction is found along the Santa Ynez River and tributary streamcourses. These areas consist of recent alluvial deposits where soils are not well consolidated and where high groundwater levels may be present. The area along Alamo Pintado Creek is of particular concern due to the historical presence of high groundwater levels.

SEICHES

Seiches are the oscillation of water in bodies of water sometimes caused by earthquakes. A common example is the "sloshing" of water in a swimming pool during an earthquake. Seiches are potentially hazardous when the wave action created in lakes or bays is strong enough to threaten human beings and structures nearby the body of water. This is a potential concern in the area of the reservoir south of Alisal Ranch.

LANDSLIDES AND SLOPE STABILITY

Landslides are the downslope movement of geologic materials. Typically, such movement occurs as block glide (in which slope failure occurs along a planar surface and the mass of materials slides as a single block) or as a slump (in which slope failure occurs along single or multiple surfaces and the mass of materials slides in a rotational motion). The stability of slopes is related to a variety of factors, including the slope's steepness; the strength of geologic materials in terms of resistance to the downslope stress of gravity; the characteristics of bedding planes, joints, and faults; surface water and groundwater conditions; changes in loading (eg., building construction); changes in vegetation (eg., wildfire, grading, and overgrazing); exposure to weathering; and susceptibility to disturbances such as seismic shaking.

As shown on Exhibit 1, several landslides have been mapped in the hillside area east of Alisal Creek and outside of the existing Solvang corporate boundary. These represent areas where the use of corrective grading and engineering practices would be necessary to ensure the safety of future development.

In addition to landslides, other slope stability problems found in hillside areas must be considered in planning future land uses. These problems include soil creep, earthflows, and mudflows. Soil creep is the slow downslope movement of individual soil particles at varying rates. This type of movement does not involve sudden slippage such as that associated with landslides, but instead involves the gradual movement of soil parti-

cles which eventually changes the surface of affected hillsides. As shown on Exhibit 1, several areas in Solvang have been identified where soil creep is a concern.

SHRINK-SWELL POTENTIAL

Certain soils which include clay materials tend to swell when their moisture content increases and shrink when moisture decreases. In particular, soils associated with the Rincon, Monterey, and Paso Robles geologic formations typically have a high shrink-swell potential.

As moisture content varies, the resultant shrinking and swelling of these soils (known as expansive soils) can cause fairly extensive damage to structures built over such material. For example, floor slabs may be heaved or cracked, walls and ceilings may be cracked, and doors and windows may stick due to the structural movement caused by expansive soils. Exhibit 1 indicates areas identified by the city of Solvang as having expansive soils. As shown, these soils are generally found in the neighborhoods surrounding the Village Area.

2.2 FLOOD HAZARDS

2.2.1 Historic Flooding

The principal sources of flood hazard affecting Solvang are the Santa Ynez River and Alamo Pintado Creek. Potential flooding is also a concern on other watercourses in the city such as Alisal Creek and Adobe Creek. Historical records indicate that serious flooding has occurred repeatedly on the Santa Ynez River. At least five major floods were recorded during the period of 1812 to 1907. Since 1907, reliable records have been compiled for the river. (Historical data for Alamo Pintado Creek, Alisal Creek, and Adobe Creek are not available.)

Most of the major flood episodes occurred prior to the completion of the Bradbury Dam in 1953. Nevertheless, the Bradbury Dam was not constructed with the primary intent of providing flood control and is expected to have

LEGEND

- ALLUVIUM
- BRANCH FAULTS
- SANTA YNEZ FAULT
- KNOWN LANDSLIDES
- LANDSLIDE POTENTIAL
- SOIL CREEP
- EXPANSIVE SOILS
- HIGH GROUNDWATER

SOURCE: CALIFORNIA DIVISION OF MINES AND GEOLOGY, CALIFORNIA GEOLOGICAL MAP, CITY OF SOLVANG

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Geological Hazards

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EXHIBIT 1

little effect on large floods. For example, a flood of 100,000 cubic feet per second (cfs) measured before Bradbury Dam was constructed would be reduced to 90,000 cfs with the dam in place.

The most significant historical flood events along the Santa Ynez River are summarized below.

- January 9, 1907 - This was the most devasting flood ever recorded on the Santa Ynez River. It resulted from a four-day storm which dropped 11.8 inches of rain on San Marcos Pass. The resultant flood flows of 120,000 cfs destroyed all highway bridges in its path, affected agricultural land over a wide area, took two lives, and transported so much sediment that a 1/4-mile sandbar was formed offshore at the river's mouth.

- March 3, 1938 - This flood resulted from a four-day storm which dropped 12.6 inches of rain at San Marcos Pass. Floodflows of 43,700 cfs damaged bridges and undercut land along the banks of the river.

- January 15, 1952 - Flood flows of 37,000 cfs followed a four-day storm which dropped 15.14 inches of rain on San Marcos Pass.

- January 20-26, 1969 - FLooding during this period was of similar magnitude to the Intermediate Regional Flood (100-year flood) involving flood flows of approximately 90,000 cfs. This food caused severe erosion along the river banks, destroyed the Alisal Road bridge, and caused extensive property damage in the Solvang area.

Overall, streamflow records since 1907 indicate two floods with discharges ranging between 50,000 and 120,000 cfs, three floods with discharges ranging between 30,000 and 50,000 cfs, and nine floods ranging from 15,000 to 30,000 cfs.

2.2.2 Existing Flood Hazard Areas

Flood hazard areas in the Solvang area have been mapped through the National Flood Insurance Program administered by the U.S. Department of

Housing and Urban Development (HUD) and the Federal Emergency Management Agency (FEMA). The Flood Insurance Rate Map (FIRM) prepared for the Solvang area delineates areas exposed to potential 100-year and 500-year flooding. A 100-year flood, also known as an intermediate regional flood, is defined as flooding that can be expected once every one hundred years or which has a one percent probability of occurring in any given year.

It is estimated that a 100-year flood along the Santa Ynez River in the Solvang area would have a peak discharge of approximately 90,000 cfs. The depth of water on the floodplain would range between six and thirteen feet. Flow velocities would be approximately fourteen feet per second (or ten miles per hour) in the main channel and five feet per second (or three mph) on the floodplain.[1]

A 100-year flood along Alamo Pintado Creek in the Solvang area would have a peak discharge of approximately 14,000 cfs. The depth of water on the floodplain would range between one and five feet. Flow velocities would be approximately nineteen feet per second (or thirteen mph) in the stream channel and six feet per second (or four mph) on the floodplain.

A 500-year flood, also known as a standard project flood, is defined as flooding that would occur if the maximum storm of record in southern California was centered over the previously saturated watershed of a given drainage course. Most flood control projects are designed for flooding of this magnitude (hence the name, "standard project flood") since it is regarded as a reasonably foreseeable "worst-case" scenario. The recurrence interval for standard project flooding is generally estimated to be once every 200 to 300 years.

A 500-year flood along the Santa Ynez River in the Solvang area is estimated to involve a peak discharge of approximately 105,000 cfs. The depth of water on the floodplain would range between eight and fifteen feet. Flow velocities would be approximately fifteen feet per second (or ten mph) in the channel and five feet per second (or three mph) on the floodplain.

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1 Flow velocities greater than three feet per second combined with depths of three feet or more are considered hazardous.

A 500-year flood along Alamo Pintado Creek in the Solvang area would have a peak discharge of approximately 16,500 cfs. The depth of water on the floodplain would range between three and seven feet. Flow velocities would be approximately twenty feet per second (or fourteen mph) in the stream channel and six feet per second (or four mph) on the floodplain.

Exhibit 2 illustrates the 100-year and 500-year flood zones found in the Solvang area. Given the substantial degree of hazards associated with flooding, the need to give strong consideration to the relationship between land use and flooding potential is described in the following subsection.

2.2.3 Land Use/Floodplain Considerations

The relationship between land use and flood hazards has two key aspects. First, the potential for flooding is a major constraint to land development in that the hazards posed by flooding severely restricts the types of land uses within the floodplain. Second, urban land use development could result in adverse effects on downstream areas by increasing the potential for flooding. These key considerations are discussed below.

FLOODPLAIN ZONING/LAND USE COMPATIBILITY

Floodplains are relatively flat land areas subject to periodic inundation by nearby drainage courses. These areas have historically attracted human settlement by virtue of their flat terrain, proximity to water, and soil characteristics that are often very fertile. It is important to recognize that periodic flooding is a natural process that creates the conditions on the floodplain which attracts development in the first place. Flooding represents a hazard only after human settlement on the floodplain exposes people and property to risks associated with the inevitable flood flows.

Of course, water control measures such as the construction of dams, levees, retention basins, channel improvements, etc. are available to reduce the extent of flooding. However, even the most modern engineering practices cannot be substituted completely for implementing appropriate land use restrictions within floodplains.

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100 YEAR FLOOD ZONE

500 YEAR FLOOD ZONE

SOURCE: FEDERAL EMERGENCY MANAGEMENT AGENCY FLOOD INSURANCE RATE MAP

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Flood Zones

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Areas potentially subject to inundation by 100-year floods should generally be limited to land uses that do not interfere with the capacity of the drainage course and that minimize hazards posed to people and property. Thus, agricultural and recreation/open space land uses are considered the most appropriate land uses for the 100-year flood zone. Further, the development of any such use should not involve, or at least minimize, the development of structures that would be exposed to 100-year floodwaters. The only areas in Solvang where development has occurred within a 100-year flood zone is along Alamo Pintado Creek near State Route 246, and portions of the Alisal Golf Course. No new urban development should be permitted within any 100-year flood zone unless it can be demonstrated that building pads will be located above the 100-year flood level and/or floodproofing measures are incorporated into project design.

Areas within the 500-year floodplain are generally subject to a lesser degree of risk as compared to the 100-year floodplain. Therefore, urban land uses may be permitted with the understanding that some degree of risk is assumed for potential damage resulting from infrequent and typically shallow flooding. The only area in Solvang where development has occurred within a 500-year flood zone is the eastern portion of the Creekside neighborhood along Alamo Pintado Creek.

The general plan land use element designates two areas for residential development that could be affected by flood hazards. One area is the neighborhood along Old Mill Road just south of State Route 246. Portions of this area are within Alamo Pintado Creek's 100-year and 500-year flood zones. The other area is the eastern portion of the Duff Ranch neighborhood located east of Alisal Road and north of the Santa Ynez River. This area is within Alamo Pintado Creek's 100-year and 500-year flood zones. Therefore, future development in these areas must be required to integrate appropriate design measures that will minimize the potential effects of flooding.

EFFECTS OF URBANIZATION

Urban development can result in adverse effects upon downstream areas involving increased flooding and/or erosion and sedimentation problems.

Since urbanization involves the construction of streets, sidewalks, parking lots, and buildings, the amount of impermeable land area within the watershed is increased. Thus, the increase in impermeable surfaces associated with buildout of the Solvang General Plan is expected to reduce the land area capable of absorbing precipitation. Consequently, stormwater runoff conveyed to the Santa Ynez River will increase in both volume of flow and flow velocity.

Further, urban development typically involves the development of storm drain systems designed to convey stormwater from urban development directly to streams and river. While the effect of individual projects themselves may be relatively minor, the cumulative effect of increased impermeable surfaces and storm drain construction throughout upstream portions of Solvang could result in greater frequency and magnitude of flooding in downstream areas along the Santa Ynez River.

Urbanization also can result in increased erosion and sediment transport effects. As vegetation is removed during site preparation and grading activities, soil is exposed and is much more susceptible to wind and water erosion. Further, the increased velocity of runoff resulting from the construction of impermeable surfaces can increase the erosive power of storm flows. Thus, downstream areas may experience increased sediment deposition which can affect water quality and related biological resources adversely.

2.3 FIRE HAZARDS

2.3.1 Types and Causes of Fires

Fire hazards in Solvang take two basic forms. Structural fires in urban areas typically pose an immediate hazard to the affected structure's occupants and any nearby structures. Such fires are usually caused by arson, carelessness, or by malfunctioning equipment and are usually brought under control relatively quickly by Solvang's Fire Department.

Wildland fires can spread quickly across a wide portion of undeveloped area, particularly hillside and mountain areas. Although some wildland

fires have a natural origin (ie., lightning), the vast majority are caused by human beings either through arson or through carelessness. Given the far-reaching and potentially devasting consequences of wildland fires, it is important to recognize high fire hazard areas and to integrate related considerations into the land use planning and development process. The following subsections describe areas of high fire hazard in the Solvang area and discuss ways to minimize such hazards through appropriate planning and development measures.

2.3.2 Fire Hazard Areas

The county of Santa Barbara has mapped three types of fire hazard areas based on a classification system developed by the California Department of Forestry in 1973. These classifications reflect an area's characteristics related to fuel loading (ie., the density and type of vegetation), fire weather (ie., the expected number of "critical fire weather" days per year), and topography. Wildfires tend to spread more rapidly on steeper slopes and firefighting is more difficult on steeper slopes since the mobility of firefighters and equipment is much more limited.

The county's fire hazard mapping identifies hazardous areas as follows:

1. Extreme fire hazard - includes all non-urban areas covered by grassland, scrub, or woodlands where slopes exceed 40 percent.

2. High fire hazard - includes non-urban areas covered by scrub and woodlands where slopes are less than 40 percent and where there are no more than 9.5 "critical fire weather" days annually.

3. Moderate fire hazard - includes agricultural areas and grasslands exposed to no more than 9.5 "critical fire weather" days, or where slopes are less than 40 percent in areas expected to exceed 9.5 "critical fire weather" days.

Most of the Solvang area is within a moderate fire hazard area. However, hillside areas in the northern and southern portions of the city are classified as high or extreme fire hazard areas due primarily to the density of

vegetation (Exhibit 3). Fire hazard levels within highly urbanized portions of the city, such as the Village Area, are not currently identified. The future identification of high fire hazard areas could provide the basis for special building requirements within such areas.

2.3.2 Fire Hazard/Land Use Considerations

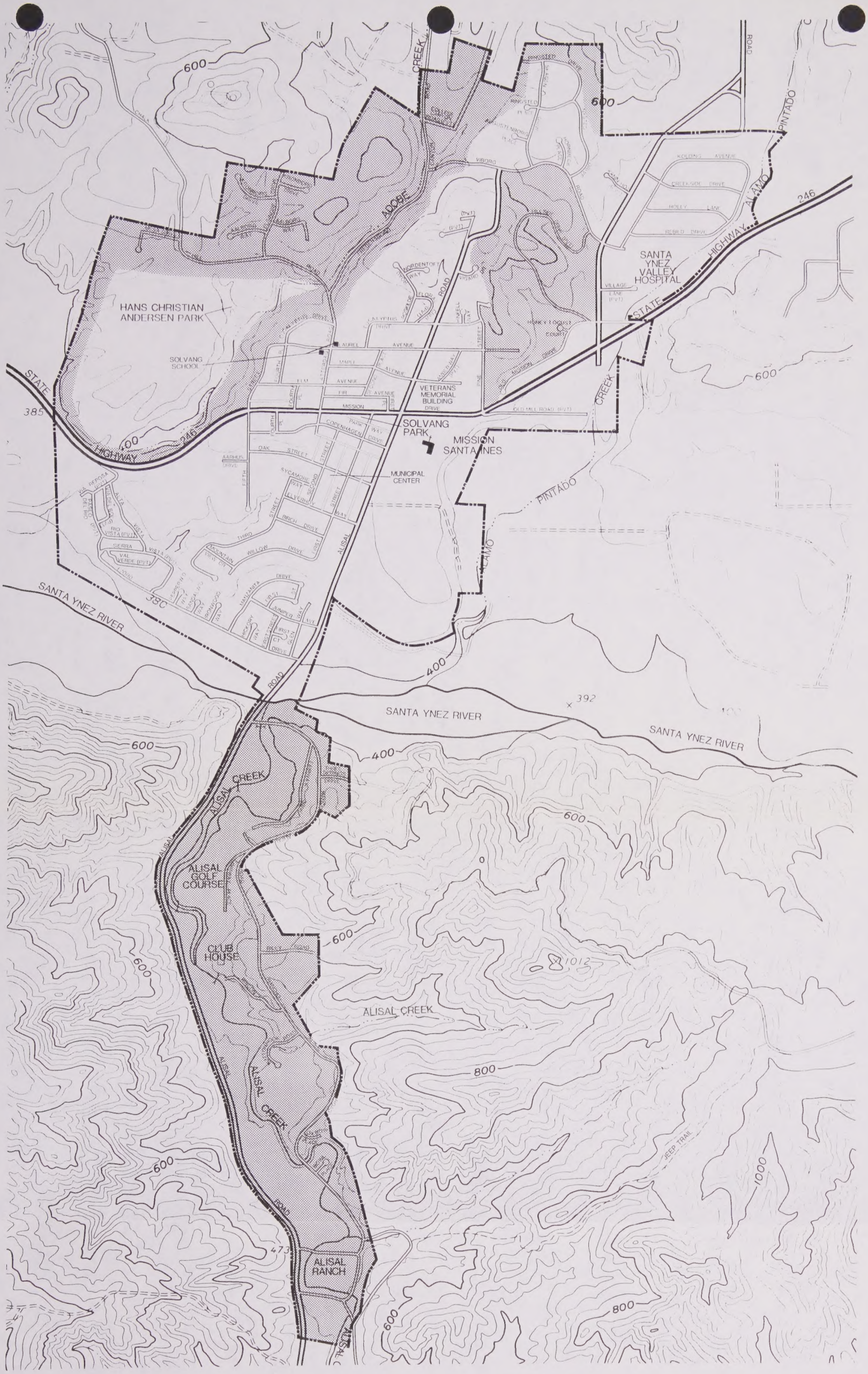
Although most wildland fires are caused by human beings, it is important to recognize that fires are part of the natural cycle. They are occasionally necessary to eliminate dead vegetation and to help regenerate the ecosystem. They are considered hazardous primarily because of the dangers they pose to human beings and developed properties. The need to minimize the exposure of people and property to fire hazards requires a twofold approach. One aspect involves the use of appropriate land use planning and development regulations. The second aspect involves fire prevention, management, and control measures. Each aspect of this twofold approach is described below.

PLANNING AND DEVELOPMENT REGULATIONS

Land development within areas of high or severe fire hazard will increase the number of people exposed to risk and will increase the value of property that could be destroyed. Further, by altering vegetation and increasing human activity in such areas, land development can increase the degree of potential hazard.

Perhaps the most appropriate land uses within high hazard areas would be open space preserves or light recreational. However, practical considerations involving the development rights of private landowners, the need for a balanced mix of land uses in Solvang, and the public cost of maintaining open space/recreational areas limit the extent to which high hazard areas can be restricted from development.

Since a complete prohibition of development in high hazard areas is not practical, it is necessary to ensure that future land uses are developed in accordance with strict regulations concerning land use types, densi-



Fire Hazard Areas

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ties, and site design. The Solvang Municipal Code includes adoption of the Uniform Fire Code which contains specific development regulations for areas of high and severe fire hazard.

In general, site plans for any development proposed in high hazard areas are subject to the review of the Solvang Emergency Services Coordinator and Fire Marshal during the city's site plan review process. Such plans must satisfy the city that the site provides adequate emergency access, has adequate water supply and pressure to meet fireflow needs, and provides an adequate fuelbreak or buffer zone to prevent the spread of structural fires to wildland areas. Further, strict enforcement of building codes will minimize potential fire hazards resulting from inappropriate building materials or structural design.

PREVENTION AND CONTROL

The imposition of strict zoning and development regulations such as those referenced above represents a key method of fire prevention. Other fire prevention and control measures include the removal or reduction of vegetation that constitutes fuel for fires in or near developed areas, controlled burning (particularly in areas of dense, dead vegetation), and the development of a network of firebreaks that reduce the potential spread of wildfires.

Maintaining adequate emergency response capabilities is also necessary to ensure that fires are controlled if and when they occur. The Solvang Fire Department should be provided with sufficient financial resources to maintain its facilities, equipment, and personnel at levels appropriate to the needs identified by the city's Emergency Services Coordinator. Further, city and county emergency roads to high fire hazard areas should remain unobstructed and in adequate condition so that emergency vehicles will continue to have access to these areas.

2.4 HAZARDOUS MATERIALS

2.4.1 Introduction

A hazardous material is defined as any injurious substance, including pesticides, herbicides, toxic metals and chemicals, explosives, volatile chemicals, and nuclear fuels and materials. The use of hazardous materials is widespread today in industrial and agricultural activities. As a result of revelations during recent years regarding the adverse health effects of hazardous materials (eg., Love Canal in upstate New York and the Stringfellow Acid Pits in southern California), public concern about this issue has grown significantly. This increased attention has led to a variety of federal, state and local regulations controlling the transport, use, storage, and disposal of hazardous materials.

Hazardous materials can be classified into four general categories: toxins, irritants, flammables, and explosives. Toxins include a wide range of industrial chemicals and agricultural pesticides which are capable of producing serious illness or death due to poisoning. Irritants can cause inflammation or destruction of living tissue with effects ranging from mild to severe, based on the degree of exposure and the type of material involved. Flammables are dangerous because of their low ignition temperatures and rapid burning characteristics. Some flammables burn so violently that they cannot be extinguished, and must be allowed to burn out naturally. Explosives can produce rapid chemical reactions causing damage due to blast and flash fire. Because of their widespread use, it can be assumed that each type of hazardous material is either transported through, used, or stored to some degree within the Solvang area.

The following subsections describe the known status of existing hazardous materials conditions in Solvang and describe strategies to safeguard the public from risks involving hazardous materials incidents.

2.4.2 Existing Hazards

Potential public health and safety effects associated with hazardous materials generally involve dangers present at a given site and risks

associated with transporting hazardous materials. Potential dangers at a given site may involve the production, storage, use, and/or disposal of hazardous materials.

Pursuant to Assembly Bill (AB) 3750, the state Office of Planning and Research (OPR) has compiled a list of hazardous materials sites throughout California. Based upon input from the State Department of Health Services, the State Water Resources Control Board, and the California Waste Management Board, the list is intended to inform local agencies of hazardous waste and substance sites identified by the state as being within the local agencies' jurisdictions.

AB 3750 requires each applicant for a development project to consult the list, available at the local agency, and to submit a signed statement indicating whether or not the proposed project is located on a listed site. This statement must be submitted prior to the local agency's determination that the project's applications are complete.

As of December 1987, there are no sites within or in close proximity to Solvang included on OPR's list. This status is subject to change as new information becomes available in conjunction with OPR's semi-annual update of the list. Given Solvang's history of agricultural activities, the continued storage and use of hazardous materials such as pesticides and herbicides is likely. Similarly, hazardous materials are likely to be found at some light manufacturing uses (eg., solvents and toxic metals) and at some commercial uses (eg., underground storage tanks at automobile service stations). The city is currently working with the county on a countywide Hazardous Waste Management Plan. Once the plan is completed, provisions applicable to the city are expected to be incorporated into the city's planning activities.

Although State Route 246 is not designated as a hazardous materials transportation route; however, there are no restrictions prohibiting its use for such transportation. Data specifically regarding the transportation of hazardous materials in Solvang are not readily available. A review of California's recent experience involving hazardous materials is useful to understanding the nature and degree of potential risks due to hazardous materials transportation in the Solvang area.

Based upon the Congressional Office of Technology Assessment's findings regarding the amount of hazardous materials transported nationally, an estimated four to five million truckloads of hazardous materials are transported annually throughout California.[1] The California Highway Patrol (CHP) has estimated that approximately 15 percent of trucks in rural areas and 25 percent of trucks in urban areas carry hazardous materials.[2] Although the likelihood of accidents involving truck traffic transporting hazardous materials is not greater than that for general truck traffic, the consequences of incidents and accidents[3] involving hazardous materials are much greater.

Of the 342 incidents on California's state highways involving hazardous materials reported by Caltrans in fiscal year 1984-85, 103 (or 30 percent) were accidents. The CHP reported 166 hazardous materials incidents on state highways and unincorporated county roads in 1985, of which 76 (46 percent) were accidents.[4]

Caltrans reported a total of 137,388 accidents on state highways in 1985. Thus, the 103 accidents involving hazardous materials transporters represented approximately 0.07 percent of the accidents which occurred on state highways. It is important to note that of these 103 accidents, 86 (83.5 percent) were attributed to driver error (ie., error on the part of the driver of the transporter or on the part of the driver of another vehicle).[5] In general, human error has been determined as the cause of approximately 90 percent of total truck accidents statewide.[6]

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1 California Department of Transportation (in cooperation with the California Highway Patrol and the California Public Utilities Commission), Transportation of Hazardous Materials in California by Highway and Rail, a report to the Legislature as required by Chapter 1465, Statutes of 1985 (AB 1311-Leonard), August 1986, p. 2.

2 Ibid., p. 4.

3 "Incidents" include deliberate dumping, accidental spills or leaks, and traffic accidents resulting in the release of hazardous materials. "Accidents" are unintentional events that may or may not result in the release of hazardous materials.

4 Ibid., p. 9. The difference in Caltrans and CHP statistics result from differing definitions, agency responsibilities, reporting requirements, and data collection systems.

5 Ibid., p. 10.

6 Ibid., p. 5.

Hazardous materials incidents (not involving vehicular accidents) on California's highways have also been attributed primarily to human error. Such errors typically include driver error in accepting improper shipments, mistakes when loading and unloading shipments, and failing to secure loads and/or closures properly.

2.4.2 Hazardous Materials Management

Regulations and enforcement of safety measures for the storage and use of hazardous materials is the responsibility of numerous agencies, including local fire agencies. National, state, and local fire codes act as a guideline for local enforcement.

The U.S. Environmental Protection Agency (EPA) ensures that containers of hazardous materials are properly labeled with instructions for use. The California Department of Industrial Relations, Cal-OSHA Division, regulates the proper use of hazardous materials. The U.S. Department of Agriculture and California Department of Food and Agriculture and the Department of Industrial Regulations regulate pest control operations, pesticide dealers, and pesticide users to ensure that hazardous agricultural chemicals are properly used.

To minimize risks associated with hazardous materials transportation, the U.S. Department of Transportation (DOT) and the CHP have instituted a number of programs to minimize the number of truck-involved accidents and The Transportation Safety Act (also known as the Hazardous Materials Transportation Act) authorized the DOT to regulate the safe shipment of hazardous materials. As established in Title 49 of the Code of Federal Regulations, Sections 100-199, the DOT is authorized to:

1. Establish and revise criteria for handling hazardous materials;
2. Require hazardous materials carriers, shippers, and package-container manufacturers to submit biannual registration statements;
3. Grant exemptions to issued regulations;
4. Inspect records and properties relative to packaging, containing, and transporting of hazardous materials;
5. Provide both civil and criminal penalties for violations of the HMTA or its regulations;

6. Establish facilities and staff to evaluate risks and set up a central reporting and data system to facilitate hazardous materials emergency response; and

7. Conduct a continuing review of all aspects of the transportation of hazardous materials to recommend steps to ensure safety and to prepare an annual report to Congress.[1]

The CHP's efforts to minimize hazardous materials incidents and accidents are an integral part of its on-going commercial vehicle enforcement program. This program includes the following measures:[2]

- Formal inspections of hazardous materials transporters
- Rules-of-the-road enforcement
- On-highway and off-highway commercial vehicle inspections
- Weight enforcement
- Major incident response teams
- Concerted education and enforcement efforts directed toward drivers on specified commercial corridors
- Production of truck safety maps in conjunction with the California Trucking Association and other trucking industry liaison activities
- Participation in the Department of Health Services' Hazardous Waste Strike Force

The CHP believes that the implementation and improvement of on-going commercial vehicle programs effectively reduces the risk of truck-involved accidents.

2.5 AIRCRAFT HAZARDS

The Santa Ynez Valley Airport is the closest airport to Solvang. It is a general aviation facility located approximately 2-1/2 miles to the east of

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1 Transportation Research Board, National Academy of Sciences, op. cit., p. 10.

2 Detailed descriptions of these measures are provided in the book entitled Commercial Vehicle Activities, prepared by the Department of the California Highway Patrol, June 1986.

the city. It does not pose any extraordinary hazard to Solvang. Further, Solvang is located outside of the airport's area of influence as designated in the Santa Barbara County Airport Land Use Plan.[1] Therefore no special planning measures are necessary to manage potential aircraft hazards in Solvang.

2.6 OTHER PUBLIC SAFETY ISSUES

2.6.1 Law Enforcement

The city of Solvang contracts with the Santa Barbara County Sheriff's Department for law enforcement services. The Sheriff's Department provides the city with a full range of services which includes uniformed patrol, detective follow-up, traffic enforcement, accident investigation, and administrative and supervisory functions.

The Sheriff's Department serves the city from its Solvang Substation. The substation is commanded by a lieutenant, and there are two sergeants, one detective, one senior deputy, and thirteen patrol deputies assigned to the station. One sheriff on a 24-hour basis and one detective are assigned to Solvang with necessary backup. The city supplies the sheriff with a patrol vehicle and radar equipment for speed and traffic monitoring enforcement.

Emergency response time from the Sheriff's Substation to areas within the city is approximately two minutes, while response time to other portions in the general plan study area would be a maximum of four minutes. In cases of extreme emergency which require a large number of law enforcement officers, additional personnel would respond as needed from the Sheriff's Headquarters in Santa Barbara, the Lompoc Substation, and/or the Santa Maria Substation.

The Sheriff's Department typically responds to growth by assigning additional deputies to an area in direct proportion to its increase in popula-

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1 Santa Barbara County Airport Land Use Commission and Santa Barbara County-Cities Area Planning Council, Santa Barbara County Airport Land Use Plan, Revised October 1982.

tion. Accordingly, the need for augmented law enforcement services resulting from increased resident and visitor population in Solvang can be met by increasing the number of deputies available to the city commensurate with the city's ability to pay. Further, the need for increased law enforcement services can be minimized to some degree by improving the city's traffic circulation systems and by requiring new developments to incorporate "defensible space" measures in project design. Such measures typically include adequate lighting of exterior areas and the use of burglary-resistant hardware and fixtures in buildings.

2.6.2 Public Health

Santa Ynez Valley Hospital currently provides emergency services to Solvang and other communities in the Santa Ynez Valley. The hospital offers a three-bed emergency room with a standby emergency level. Emergency care is available 24 hours a day.

The county of Santa Barbara contracts with a private operator to provide a Paramedic Advanced Life Support (ALS) ambulance on a 24-hour basis in the Solvang/Santa Ynez area. The emergency response time to Solvang is less than five minutes, which is considered excellent. Other ambulance units in the Santa Barbara and Santa Maria areas offer back-up services. Paramedics are in direct radio and telemetry contact with the Santa Ynez Valley Hospital emergency room, which is a county-approved base station hospital.

2.6.3 Disaster Preparedness

Disaster preparedness typically involves the development of response procedures, identification of evacuation routes, design and installation of warning systems, purchase of emergency equipment, and training of emergency personnel. It is through such proactive measures that the effectiveness of other emergency management procedures is ensured.

These other emergency management procedures include response, recovery, and mitigation programs. Response mechanisms come into play when a hazard event occurs and may include warnings, evacuations, rescue operations,

fire fighting, emergency medical care, emergency food and shelter provisions, and measures to preserve public health and safety such as riot control.

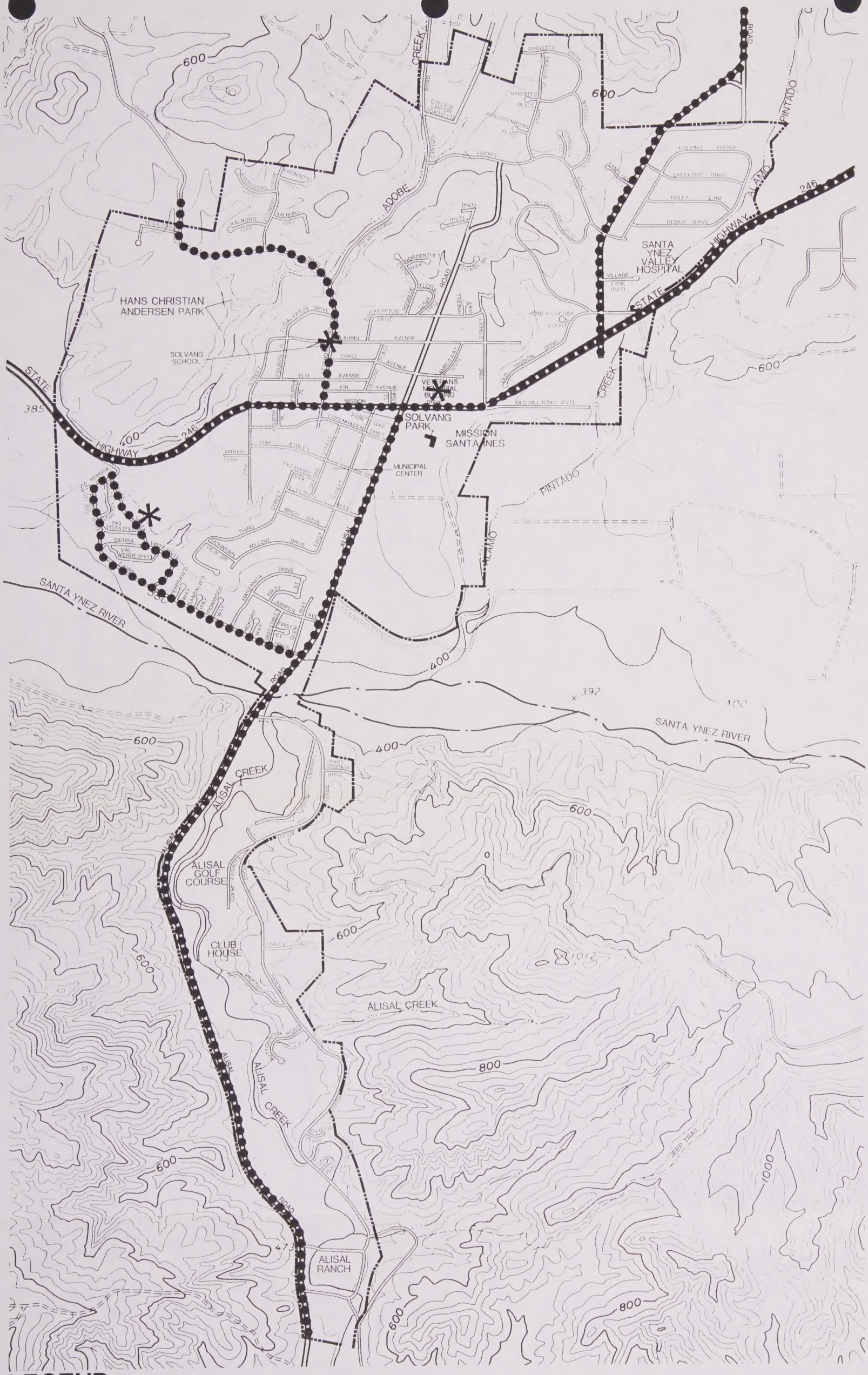
Following the hazard event, recovery activities may involve repairing damaged roads, buildings, pipelines, and re-establishing the community's physical, social, and economic systems.

Mitigation programs are akin to preparedness actions in that they are measures to reduce or eliminate the adverse effects of future hazard events. Mitigation programs are those that go beyond the typical objectives of preparedness, response, and recovery. The principal forms of mitigation are as follows:

- Implementation of land use controls to prevent or limit the location of development and populations in areas that are susceptible to hazard events;
- Enforcement of building codes established to minimize the likelihood or extent of damage, which may necessitate the design or construction of a building; and
- Installation of structural barriers (eg., dams and levees) to shield people and development from harm.

The city of Solvang's Director of Emergency Services is responsible for overseeing the city's disaster preparedness program. Solvang's program for local emergency management is established in the City Multi-Hazard Functional Plan that was approved by the State Office of Emergency Services in March 1987. Key aspects of Solvang's local emergency management program involve disaster evacuation and the operation of emergency shelters. The city's evacuation routes and emergency shelters are shown on Exhibit 4.

Larger emergency response actions are managed on a regional basis by the Santa Barbara County Office of Disaster Preparedness, on a statewide basis by the State Office of Emergency Services, and on a federal basis by the Federal Emergency Management Agency (FEMA). Solvang's Director of Emergency Services is responsible for coordinating the city's emergency response actions with these agencies.



LEGEND

EVACUATION ROUTES

SHELTERS

SOURCE: CITY OF SOLVANG

Emergency Evacuation Routes and Shelters

SOLVANG GENERAL PLAN

CITY OF SOLVANG

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MILES

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EXHIBIT 4

3.0 GOALS, OBJECTIVES, AND POLICIES

GOAL 3.1

TO MINIMIZE HAZARDS TO PUBLIC HEALTH, SAFETY, AND WELFARE RESULTING FROM NATURAL AND MAN-MADE PHENOMENA.

Objective 1.0

Ensure that geologic hazards in all areas for human use or habitation are mitigated properly or avoided prior to or during development.

Policy 1.a The city shall require geotechnical investigations by a certified engineering geologist and registered civil engineer for all grading and construction proposed within any area of potential slope instability and/or areas subject to severe seismic hazards.

Policy 1.b The city shall provide qualified expertise for the review of geotechnical reports and sufficient personnel for the field inspection of grading operations and construction.

Policy 1.c The city shall require construction to be in conformance with the Uniform Building Code, specifically Chapter 23 as it provides for earthquake-resistant design, Chapter 70 as it provides for excavation and grading, and with the city's adopted hillside development ordinance.

Objective 2.0

Establish siting and development standards to reduce risk and damage from flood hazards.

Policy 2.a The city shall enact an ordinance which specifies the types of land uses to be permitted within 100-year flood hazard areas and which requires all structures proposed within 100-year flood zones to be elevated at least one foot above the 100-year flood level.

Policy 2.b The city shall require the submittal of information prepared by a qualified civil or hydrological engineer which certifies compliance with development standards established for 100-year flood zones.

Objective 3.0

Minimize the adverse effects of urbanization upon drainage and flood control facilities.

Policy 3.a The city shall require the implementation of adequate erosion control measures for development projects to minimize sedimentation damage to drainage facilities.

Policy 3.b The city shall maintain its open space preserves and shall require developers to provide adequate open space pursuant to the standards established in the Parks and Recreation Element of the General Plan and the city's zoning ordinance as a measure to minimize impermeable surfaces throughout the city.

Policy 3.c The city shall cooperate with the Santa Barbara County Flood Control District to ensure that citywide development does not lead to significant adverse effects upon the county's flood control facilities.

Objective 4.0

Ensure the eligibility of property owners for federal disaster assistance and federally insured loans or mortgages for developments located within the 100-year flood zone.

Policy 4.a The city shall enter into the U.S. Department of Housing and Urban Development's Flood Insurance Program.

Objective 5.0

Establish fire prevention regulations and standards to minimize potential fire hazards and fire losses.

Policy 4.2: The city shall review the consideration of interceptor pipeline as a qualified civil or hydrologic engineer with adequate capabilities with experience evaluating mitigation for 100-year flood zones.

Objective 4.4

Minimize the adverse effects of hydrologic open drainage and flood control facilities.

Policy 4.4: The city shall require the preparation of adequate drainage analysis for proposed projects to minimize environmental impacts to drainage facilities.

Policy 4.5: The city shall provide the open space protection and preservation functions of drainage ways where feasible in lieu of flood control pipes and channels in the future, and encourage the planning of the general plan and city's zoning ordinance in a manner to minimize impacts on flood conveyance and utility.

Policy 4.6: The city shall coordinate with the Santa Barbara County Flood Control District on ways to reduce future drainage problems, and take to the Board of Supervisors such efforts upon the County's flood control facilities.

Objective 4.5

Assure the availability of properly zoned for future disaster assistance and temporary housing sites or shelters for environmentally located within the 100-year flood area.

Policy 4.6: The city shall notify the S.B. Department of Planning of those inadequately zoned locations for the.

Objective 4.6

Establish flood insurance regulations and charge to minimize potential flood damage and flow impacts.

Policy 5.a The city shall enact an ordinance which establishes criteria for land development in hillside areas with emphasis on fire-retardant construction materials, access for fire-fighting personnel and equipment, removal of combustible vegetation, and minimizing the overall exposure to risks associated with wildfires and adjacent structure fires.

Policy 5.b The city shall enact an ordinance which establishes structural design standards to ensure adequate fire safety.

Policy 5.c The city shall ensure that development is phased properly in relation to the city's ability to provide an adequate level of fire protection.

Policy 5.d The city shall establish a city Fire Department or shall hire a firefighting professional responsible for coordinating volunteer firefighters and for reviewing proposed site plans to ensure that adequate fire safety measures are provided.

Objective 6.0

Establish a program to ensure the safe handling, disposal, and cleanup of hazardous materials in conjunction with federal, state, and regional programs and regulations.

Policy 6.a The city shall enact an ordinance which sets forth restrictions and safeguards concerning the use, storage, and disposal of specific hazardous materials.

Policy 6.b The city's Director of Emergency Services shall establish and periodically update an inventory of hazardous materials produced, stored, or otherwise located within the city for purposes of coordinating emergency response.

GOAL 3.2

TO PROVIDE A SAFE AND SECURE ENVIRONMENT FOR THE CITY'S RESIDENTS, WORKERS, AND VISITORS

Objective 1.0

Provide an adequate level of police protection throughout the city.

Policy 1.a The city shall provide a minimum of one full-time police officer per 1,500 residents.

Policy 1.b The city shall enact an ordinance which specifies site design standards for ensuring adequate emergency access.

Policy 1.c The city shall require new developments and improvements to employ defensible space concepts into site design and building specifications (eg., appropriate setbacks, adequate lighting of walkways and parking lots, and the use of burglary-resistant hardware and fixtures in buildings).

Objective 2.0

Enhance public awareness and participation in crime prevention.

Policy 2.a The city shall encourage the establishment of a Neighborhood Watch program and shall provide ongoing support to participating neighborhoods.

Objective 3.0

Establish an emergency preparedness program and maintain the program through regular practice drills and periodic updating of the program.

Policy 3.a The city shall establish an Emergency Response Team composed of key city staff.

Policy 3.b The city's Emergency Response Team shall develop a detailed emergency response manual which describes the appropriate actions and responsibilities of personnel designated for participation in emergency response activities. This manual shall become a working document and shall be made available to the public and city staff. Further, this document shall be updated at a minimum of every five years.

Policy 3.c The emergency response manual shall include a map indicating clearly the city's designated evacuation routes and an operating plan for evacuation management to ensure safe and orderly evacuation.

Policy 3.d The city's Emergency Response Team shall be responsible for directing the city's personnel and volunteers involved in disaster relief and emergency evacuation efforts. The team also shall be responsible for coordinating the city's emergency response with federal, state, and other local agencies.

Policy 3.e The Emergency Response Team shall direct annual practice drills involving key city personnel, volunteers, and other entities responsible for conducting emergency response activities.

4.0 THE SAFETY PLAN

As discussed in Section 2.0 of this safety element, a variety of safety issues (such as geologic hazards, flood hazards, and fire hazards) have a substantial effect upon urban development. To ensure that these issues receive appropriate consideration, the primary responsibility for implementation of the policies established in this safety element is with the city Planning Department and the city's Emergency Services Coordinator. The city Planning Department is responsible for evaluating proposed development projects to identify potential hazards associated with the development. The Planning Department's site plan review process therefore takes into consideration possible seismic, geologic, flood, and fire hazards. Proposed projects which have potential adverse effects related to safety considerations should have measures to mitigate such effects pursuant to the California Environmental Quality Act (CEQA). The Planning Department is charged with ensuring compliance with CEQA in processing development proposals. Nevertheless, the Solvang Planning Commission and City Council bear ultimate responsibility for certifying compliance with CEQA and for imposing specific mitigation measures as conditions of project approval.

The Emergency Services Coordinator and Fire Marshal are responsible for reviewing development proposals to identify potential hazards related to fire. The Emergency Services Coordinator also is responsible for the

appropriate management of emergency response facilities personnel and equipment as allocated by the Solvang City Council.

Disaster preparedness and response activities, including planning, training of personnel, implementation of response mechanisms (eg., evacuation), and interagency coordination shall be managed by the Emergency Services Coordinator. The Solvang City Council is responsible for appropriating adequate resources to meet emergency response requirements.

With respect to hazardous materials, the Emergency Services Coordinator, with support from the city Planning Department, is responsible for establishing an inventory of hazardous materials produced, stored, or used in Solvang. The Planning Department is responsible for consolidating the city's inventory with semi-annual listings distributed by the State Office of Planning and Research and for requiring project applicants to consult said list pursuant to the requirements of AB 3750.

5.0 GLOSSARY

Critical Facility: Includes facilities housing or serving many people or otherwise posing unusual hazards in case of damage from or malfunction during an earthquake, such as hospitals, fire, police, and emergency service facilities, utility "lifeline" facilities, such as water, electricity, and gas supply, sewage disposal, and communications and transportation facilities.

Fault: A fracture in the earth's crust forming a boundary between rock masses that have shifted.

Active Fault: A fault that has moved recently and which is likely to move again. For planning purposes, "active fault" is usually defined as one that shows movement within the last 11,000 years and can be expected to move within the next 100 years.

Potentially Active Fault: 1) A fault that last moved within the Quaternary Period before the Holocene Epoch (the last 2,000,000 to

11,000 years); 2) a fault which, because it is judged to be capable of ground rupture or shaking, poses an unacceptable risk for a proposed structure.

Inactive Fault: A fault which shows no evidence of movement in recent geologic time and no potential for movement in the relatively near future.

Ground Failure: Mudslide, landslide, liquefaction, or the seismic compaction of soils.

Hazardous Material: An injurious substance, including pesticides, herbicides, toxic metals and chemicals, liquified natural gas, explosives, volatile chemicals, and nuclear fuels.

Landslide: A general term for a falling mass of soil or rocks.

Liquefaction: A process by which water-saturated granular soils transform from a solid to a liquid state because of a sudden shock or strain.

Seiche: An earthquake-induced wave in a lake, reservoir, or harbor.

Subsidence: The gradual, local settling or sinking of the earth's surface with little or no horizontal motion. (Subsidence is usually the result of gas, oil, or water extraction, hydrocompaction, or peat oxidation, and not the result of a landslide or slope failure.)

Surface Rupture: A break in the ground's surface and associated deformation resulting from the movement of a fault.

Wildland Fires: Fires occurring in a nonurban, natural area which contains uncultivated lands, timber, range, watershed, brush, or grasslands.